

Exhibit C

**Tennessee Valley Authority
Regulatory Submittal for Kingston Fossil Plant**

Documents submitted

Site Wide Safety and Health Plan (Rev 5) with revised IH plan

Date submitted

10/14/2010

Submitted to whom

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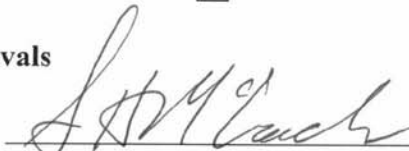
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Date 10/14/10

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Date 10/21/10

APPROVALS

By their signature, the undersigned hereby certify that this Site Wide Safety and Health Plan has been reviewed and approved for use at TVA's Kingston Ash Recovery Project in Kingston, Tennessee.



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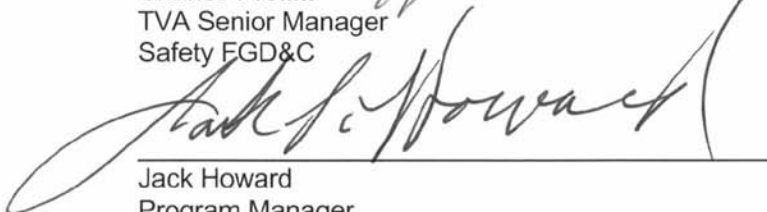
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**SITE WIDE SAFETY AND HEALTH PLAN
FOR THE
TVA KINGSTON FOSSIL PLANT
ASH RELEASE RESPONSE**

Prepared for:



Tennessee Valley Authority

Prepared by:

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October 2010

Summary of Changes
Site Wide Safety and Health Plan Revision 04 to Revision 05

Section	Changes
Title Page	Changed Revision 04 to Revision 05
Title Page	Changed date from February 2010 to August 2010
Signature Page	Changed from Michael Scott to Kathryn Nash Changed from Sean Healey to Danny Whitaker-Sheppard
1.1 Background	Paragraph 3, line 3 – added “applicable sections of” Paragraph 3, line 4 – removed “(as applicable)”
1.2 Activities	Line 5 – removed “and” Line 6 – added “and 6) cell closure activities including deep soil mixing, ash hauling, ash stacking and capping.”
1.2.2 Ash Processing and Load Out	Line 3 – added “(Rim Ditch)” Line 4 – removed “ash disposal channel” and added “rim ditch” Line 7 – added “or with clam shell buckets or drag lines,”
1.2.3 Infrastructure and Support Activities	Added at the end of the paragraph – “Environmental sampling activities will occur on and off site involving air, water, soil, flora and fauna. These activities will at times occur on the Emory and Clinch Rivers.”
1.2.4 Environmental Sampling	Removed entire section
1.2.5 Dike Construction	Changed to 1.2.4
1.2.6 Recovery Activities	Changed to 1.2.5
1.2.6 Cell Closure Activities	Added this section
1.3 Summary of Major Hazards	Added line 3
3.2 Background and Site Description	Removed last paragraph.
4.4.3 Heat Stress	Line 4 – removed “TVA those” and added values
4.4.5 Noise	Paragraph 5 – added to last sentence “and TVA Safety Procedure #310 Hearing Conservation Program. Use of double hearing protection is required at sound levels >96dBA.”
4.4.71 Underground Utilities/Excavation Clearance and Permitting	Paragraph 2 – added after first sentence “Depending on the location of the excavation, an Ash Recovery Site permit may be developed (reference SOP-HSE_014 Excavation and Trenching from the Kingston Ash Recovery Project Management Plan). If a plant permit is required, complete...”

Section	Changes
4.4.19 Eye, Face, and Hand	Removed the "In addition, protection such as face shields or welding helmets shall be worn in addition to safety glasses" from the first part of the third sentence and added at the end "protection such as face shields or welding helmets shall be worn in addition to safety glasses."
4.4.20 Fly Ash Hazards	Added entire section
4.5 Chemical Hazards	Second paragraph – after hydraulic fluids, added "water treatment chemicals such as flocculating agents used in the dredging operations and acetic acid for ph control,"
4.5.3 Water Treatment Chemicals	Added entire section
Table 4-1	Added table
4.6.2 Insects	At the end of paragraph – added "For significant infestations, a licensed exterminator has been contracted to assist in removal. Contact the TVA Kingston Ash Recovery facilities manager for assistance."
Section 5.1.1 Integrated Air Sampling	First paragraph, added "Lead Industrial Hygiene Technologist (LIHT) and removed health and safety technician" Second paragraph, added at the end of the paragraph "Please see Appendix K for full details of the IH Monitoring Plan."
Section 5.3 Heat Stress Monitoring	At the end of the paragraph, added "confined spaces, etc.) As a minimum, each contractor on site shall provide, if work scope warrants, a qualified person able to count and record pulses/minute and read and record body temperatures as a means to fully implement the personal physiological monitoring."
Section 5.3.2 Personal Monitoring	Added paragraph 8
8.1 Basic Work Practices	At sixth bullet – removed "smoke" and added "use tobacco products (smoking, dipping, chewing)" At sixth bullet, sub-bullet 1 – removed "smoking is" and added "tobacco use are"
8.2.1 General Cleaning Requirements	Paragraph 1 – removed "smoking" and added "using tobacco products (smoking, dipping, chewing)"
8.3 Equipment Decontamination	Paragraph 2 – added guidelines
10.0 Emergency Response Plan	Paragraph 5 – removed "Appendix F, FII – Emergency Phone Tree" and added "Table 15-1 under Section 15.4.2"
10.2.1 EMS Site Access and Initial Response	Added medical emergency response steps

Section	Changes
10.3 Hazardous Material / Environmental Release	Paragraph 3 – removed “Figure FII – Emergency Phone Tree and can be found in Appendix F” and added “Table 15-1 under Section 15.4.2”
10.6 Natural Disasters / Tornadoes	Paragraph 1 – changed Figure “V” to “VIa” and add “and Figure VIb” Added paragraph 2 through 8 Added “Shelter locations at the north end of project” and “Shelter location south end of the project” and section indicating where employees drive and park and how many each stack will accommodate.
11.2 Site-Specific Training / Orientation	Paragraph 1 – Added the last sentence.
15.2 Weekly Safety Reports	Paragraph 1 – Removed “a coversheet which can be used is provided in Appendix D”
15.4.1 Incident Definition	Added bullet 5
15.4.2 Verbal Notifications	Removed “Supervisors” and added “Individuals”
16.0 References	Added OSHA website
Appendix K	Added Industrial Hygiene (IH) Monitoring Plan

TABLE OF CONTENTS

1.0	INTRODUCTION.....	1-1
1.1	Background	1-1
1.2	Activities	1-1
1.3	Summary of Major Hazards.....	1-3
1.4	Beyond Zero	1-3
1.5	Initial Site Specific Orientation.....	1-3
1.6	Subcontractor Adherence Policy	1-4
2.0	PROJECT ORGANIZATION AND RESPONSIBILITIES.....	2-1
3.0	SITE HISTORY AND PROJECT DESCRIPTION	3-1
3.1	Location	3-1
3.2	Background and Site Description	3-1
3.3	Site Characterization Data.....	3-1
3.4	Comprehensive Environmental Response, Compensation, and Liability Act Order	3-1
4.0	POTENTIAL HAZARDS OF THE SITE.....	4-1
4.1	Task Hazard Analysis.....	4-1
4.2	Zero Tolerance Issues	4-1
4.3	Site Specific Procedures	4-1
4.4	Physical Hazards.....	4-2
4.5	Chemical Hazards	4-13
4.6	Biological Hazards.....	4-22
5.0	HEALTH HAZARD MONITORING	5-1
5.1	Air Contaminants	5-1
5.2	Data Quality Assurance.....	5-3
5.3	Heat Stress Monitoring	5-4
5.4	Cold Stress Monitoring	5-5
6.0	PERSONAL PROTECTIVE EQUIPMENT	6-1
6.1	General Requirements	6-1
6.2	Levels of Protection.....	6-1
6.3	Selection of Personal Protective Equipment	6-2
7.0	ACTIVITY HAZARD ANALYSIS.....	7-1
7.1	Task Specific Activity Hazard Analysis.....	7-1
7.2	Job Safety Analysis Development from Activity Hazard Analysis	7-1
7.3	New Phases of Work	7-2
8.0	WORK ZONES, SITE CONTROL, AND PERSONAL HYGIENE.....	8-1
8.1	Basic Work Practices.....	8-1
8.2	Personnel Hygiene Facilities and Cleaning Procedures.....	8-2
8.3	Equipment Decontamination	8-4
8.4	Decontamination during Medical Emergencies	8-4
8.5	Waste Collection and Disposal.....	8-4

9.0	MEDICAL SURVEILLANCE AND SUPPORT REQUIREMENTS	9-1
9.1	Respirator Use Qualification	9-1
10.0	EMERGENCY RESPONSE PLAN	10-1
10.1	Fire / Explosion	10-1
10.2	Medical Emergencies	10-1
10.3	Hazardous Material / Environmental Release	10-2
10.4	Anthrax	10-3
10.5	Weapons of Mass Destruction	10-3
10.6	Natural Disasters / Tornado	10-3
10.7	Lightning / Severe Weather	10-4
10.8	Dam Failure / Flood	10-4
10.9	Bomb Threat	10-5
10.10	Civil Disturbance	10-5
10.11	Criminal Activity and Illegal Entry	10-5
10.12	Suspicious Packages	10-5
10.13	Evacuation / Shelter	10-5
11.0	TRAINING AND SSO MEETINGS	11-1
11.1	HAZWOPER Training	11-1
11.2	Site-Specific Training/Orientation	11-2
11.3	First Aid and Cardiopulmonary Resuscitation	11-3
11.4	Bloodborne Pathogens	11-3
11.5	Other Required Training and Qualifications	11-3
12.0	HAZARD COMMUNICATION	12-1
13.0	SUBSTANCE ABUSE	13-1
14.0	MEETINGS	14-1
14.1	Daily Safety Meetings	14-1
14.2	Weekly Site Safety and Health Staff Meetings	14-1
14.3	Progress Meetings	14-1
15.0	LOGS, REPORTS, AND RECORDKEEPING	15-1
15.1	Medical and Training Records	15-1
15.2	Weekly Safety Reports	15-1
15.3	Exposure Records	15-1
15.4	Incident Reporting, Investigation, and Case Management	15-1
15.5	Health and Safety Logbooks	15-4
15.6	Hazard Communication Program/MSDS	15-5
15.7	Work Permits	15-5
15.8	Inspections and Structured Field Visits	15-5
16.0	REFERENCES	16-1

LIST OF TABLES

Table 4-1	Chemical Hazard Exposure Limits	4-14
Table 4-2	Fly Ash Constituent Information	4-16
Table 8-1	Standard Decontamination Station Configurations	8-2
Table 15-1	Notification.....	15-2

LIST OF APPENDICES

Appendix A	Applicable Programs, Procedures and Guidelines
Appendix B	Health Hazard Evaluation
Appendix C	Site Specific Respiratory Protection Plan
Appendix D	Forms
Appendix E	Activity Hazard Analysis
Appendix F	Emergency Response and Contingency Plan
Appendix G	Training Matrix
Appendix H	Marine Operation Requirements
Appendix I	Figures
Appendix J	Response to EPA Comments
Appendix K	Industrial Hygiene Monitoring Plan

APPENDIX K
INDUSTRIAL HYGIENE MONITORING PLAN

SITE WIDE SAFETY AND HEALTH PLAN

For the

TVA KINGSTON FOSSIL PLANT
ASH RELEASE RESPONSE

TABLE OF CONTENTS

1.0	INTRODUCTION.....	K-1-1
1.1	Background	K-1-1
1.2	General Industrial Hygiene Objectives	K-1-1
1.3	Key Industrial Hygiene Personnel and Responsibilities	K-1-2
2.0	INDUSTRIAL HYGIENE PROCESS OVERVIEW.....	K-2-1
2.1	Identify Similar Exposure Groups	K-2-1
2.2	Evaluate	K-2-1
2.3	Document Control, Reporting, and Notification	K-2-2
2.4	Verify Upper Confidence Limits and Manage Further Monitoring.....	K-2-3
3.0	IDENTIFICATION OF MONITORING NEEDS	K-3-1
3.1	Existing Process	K-3-1
3.2	New Process	K-3-1
3.3	Worker Complaints	K-3-1
3.4	Management Request	K-3-1
4.0	CHEMICAL HAZARD MONITORING METHODS.....	K-4-1
4.1	Stressors of Potential Concern.....	K-4-1
4.2	Evaluation Methods To Be Used	K-4-1
4.3	Frequency of Exposure Monitoring.....	K-4-2
4.4	Exposure Limits	K-4-2
5.0	PHYSICAL HAZARD MONITORING	K-5-1
5.1	Noise	K-5-1
5.2	Thermal Stress	K-5-1
5.3	Industrial Ergonomics	K-5-1
5.4	Office Ergonomics	K-5-1
5.5	Frequency of Exposure Monitoring.....	K-5-2
5.6	Exposure Limits Recognized	K-5-2
6.0	QUALITY CONTROL / QUALITY ASSURANCE	K-6-1
6.1	Equipment Calibration	K-6-1
6.2	Laboratory Quality Control	K-6-1
6.3	Data Validation	K-6-1
6.4	Data QUALITY OBJECTIVES	K-6-2
6.5	Quality Assurance / Quality Control And Quality Assurance Project Plan (QAPP) Cross Walk Tables	K-6-4

LIST OF TABLES

Table 2-1	Similar Exposure Groups Identified at Kingston Ash Recovery Project Site.....	K-2-1
Table 2-2	Summary of Exposure Monitoring Actions.....	K-2-3
Table 4-1	Recognized Sample Methods to be Utilized	K-4-1
Table 6-1	OSHA / NIOSH Analytical and Sampling Methods and Site SOPs.....	K-6-4
Table 6-2	Quality Assurance Project Plan Cross-Walk.....	K-6-4

ATTACHMENT

Attachment K-1: Sample Health Hazard Evaluation by Exposure Group form

1.0 INTRODUCTION

1.1 BACKGROUND

This Industrial Hygiene Monitoring Plan (IHMP) has been developed as Appendix K to the TVA Kingston Fossil Plant (KIF) Site Wide Safety and Health Plan (SWSHP). The intent of this IHMP is to fully develop, discuss, and apply the monitoring strategy associated with relevant sections of the SWSHP. In the event the SWSHP is updated, this IHMP will be reviewed and updated as necessary.

The preliminary IHMP entitled "Kingston Fossil Plant Coal Ash Recovery Site Industrial Hygiene Monitoring Plan" was prepared by EnSafe Inc. and was submitted on January 21, 2009 as an amendment to the Ash Recovery Site Safety Plan. The purpose of the preliminary IHMP was to outline the EnSafe air monitoring activities during the project. This plan revises and updates the preliminary IHMP and any subsequent plans submitted in draft or final form by EnSafe. Portions of the EnSafe IHMP have been referenced and utilized within this document.

Industrial hygiene activities began on December 30, 2008 with air monitoring being performed for fly ash and its constituents. Standard methods commonly employed by TVA and EnSafe for evaluating exposures to fly ash constituents during fossil boiler outages or day-to-day production or maintenance activities were implemented during the early phase of the project.

1.2 GENERAL INDUSTRIAL HYGIENE OBJECTIVES

Evaluation and control of health related exposures on the Kingston Ash Recovery Project site are key to ensuring and maintaining the health of the site work force, particularly as the project duration creates the potential for chronic exposures to become relevant.

In addition to worker protection, a properly developed and executed Industrial Hygiene Program will provide a repository of historical information for future use.

The principal objectives of the plan are as follows:

- Identify specific responsibilities for site Health, Safety, and Environment (HSE) staff and operations management with regard to Industrial Hygiene Program support.
- Identify the various Similar Exposure Groups (SEG) to be monitored onsite with the intent of drawing group level conclusions with regard to health exposures and controls.
- Specify the target stressors (chemical, physical, biological) that will require routine monitoring for each SEG.
- Identify specific action levels to trigger mitigation or programmatic development activities. These may include field controls, work techniques, training, medical monitoring, or utilization of personal protective equipment.
- Document the monitoring protocols for the site including frequency, specific analytes to be monitored for, and the sample methods to be employed.
- Establish a means to create and distribute proper industrial hygiene documentation to TVA management, operational management, TVA contractors, and individual workers.

1.3 KEY INDUSTRIAL HYGIENE PERSONNEL AND RESPONSIBILITIES

General site safety and health responsibilities are established under Job Descriptions of the Kingston Ash Recovery Project Management Plan. This section is included as it specifically relates to executing the onsite Industrial Hygiene Program.

1.3.1 Jacobs Site HSE Manager

The HSE Manager will be the key liaison between TVA / Jacobs Engineering Group Inc., (Jacobs) management and those technical specialists performing industrial hygiene activities onsite. This includes providing summary and transmittal reports as necessary, briefings, development of site-wide guidance, and reporting in relation to industrial hygiene findings.

1.3.2 Jacobs Site Industrial Hygiene Lead Technologist

The Industrial Hygiene Lead Technologist will be responsible for:

- Executing the general monitoring strategy outlined in this plan.
- Keep the Jacobs Site HSE Manager apprised of findings on a daily basis.
- Consulting with Jacobs' Certified Industrial Hygienist (CIH) staff when difficulties or anomalous findings are identified.
- Maintaining and calibrating industrial hygiene equipment per manufacturer's requirements.
- Proper handling of samples including chain-of-custody (CoC).
- Completing exposure monitoring paperwork and field log books on a daily basis.
- Observing workers being monitored and documenting relevant information.
- Performs data evaluation, prepares reports, and issues sample notification letters.
- Providing recommendations for control strategies as related to occupational health exposures.
- Verifying the back-up Industrial Hygienist is properly trained and capable of executing associated duties in the absence of the Industrial Hygiene Lead.

1.3.3 Jacobs Industrial Hygiene Manager

Responsible for assisting in the development of this IHMP general industrial hygiene monitoring strategies, evaluation of exposures, and providing recommendations for control strategies when necessary.

1.3.4 Data Management and Quality Assurance Team

The onsite Data Management Team and Quality Assurance (QA) Team assist the Industrial Hygiene Program with respect to laboratory coordination, laboratory data management, data validation, quality assurance, and data storage in EQUIS® in accordance with Section 6.3 of this plan.

2.0 INDUSTRIAL HYGIENE PROCESS OVERVIEW

2.1 IDENTIFY SIMILAR EXPOSURE GROUPS

The collaboration of TVA Safety and Industrial Hygiene staff, EnSafe, and Jacobs have established SEGs for differing categories of employees with potentially or expected similar exposures from work conducted at the Kingston Ash Recovery Project site. Segregation into SEGs is a function primarily of equipment-specific positional assignments or site responsibilities. As sampling is performed, task assignments will be noted on sample notes and recorded in the sample records/database used, but may also be dependent on activities. In the event results are elevated, task level controls will be implemented for that task.

Table 2-1 contains a listing of SEGs presently identified for the Kingston Ash Recovery Project operations. As activities change or are added to the site, additional exposure groups may be added as necessary.

Table 2-1
Similar Exposure Groups Identified at Kingston Ash Recovery Project Site

Amphibious Excavator Operator	Mgmt / Admin
Articulated Dump Truck Operator	Misc.
Boat Laborer	Polymer
Boat Operator	Railcar Loading - Dozer
Dozer Operator	Railcar Loading - Excavator
Dredge Boat Operator	Railcar Loading - Liner
Dredge Shore Operator	Scraper Pan Operator
Dump Truck Operator	Security
Equipment Decontamination Detail	Shoreline Operator
Excavator Operator	Southern Shores
Filter Press	Track Dump Operator
Flagger	Vacuum Barge Operator
General Laborers	Vacuum Truck Operator
Grader Operator	Water Truck Operator
Lime Application/Mixing	

2.2 EVALUATE

Periodic monitoring and sampling schedules will be based on the severity of potential exposures to recognized health hazards and possibly other factors such as number of personnel exposed and frequency of task performances, etc. This will be periodically reviewed and sample priorities updated as warranted.

The Site Industrial Hygiene Lead Technologist, in collaboration with TVA and Jacobs CIH staff, will conduct a Health Hazard Analysis of existing and new SEGs identified on the site using Attachment K-1, Sample Health Hazard Evaluation by Exposure Group form. Table 2-2 will be used to initially evaluate the potential for exposures to exist. Existing data will be used to evaluate exposures based on SEGs. Where existing data is not available, an objective

exposure determination will be made which may include the use of calculations, direct read monitoring and integrated monitoring. This process will continue for each SEG and each recognized health hazard until adequate exposure characterization has been completed.

The qualitative exposure assessment captured by Table 2-2 includes an evaluation of potential chemical exposures via inhalation, ingestion, and dermal contact and/or absorption. The assessments also include the potential exposures to noise and radiation and other potential physical hazards. The predominant exposure determinants and events such as frequency, magnitude, and variability of exposure and tasks, route of exposure, potentials for acute or chronic exposures or frequently repeated tasks and exposures along with the adequacy and potential for failure of engineering and work practice controls are considered as a part of the qualitative exposure assessment.

As new processes and tasks are identified on the Kingston site, the potential hazards will be included in the new Activity Hazard Analysis (AHA), and subsequently, the new or redefined operations may be re-categorized depending on existing SEGs. However, the Jacobs CIH staff will determine new strategies, as appropriate, to evaluate new potential exposures. If the qualitative exposure assessment indicates a minor, or no risk of exposure, no further action is required.

2.3 DOCUMENT CONTROL, REPORTING, AND NOTIFICATION

Independent of routine reporting, electronic and paper files will be kept for project documentation purposes. This information will be properly controlled and handled via the project Document Control process and includes CoCs, raw and interpreted lab data, exposure calculations, copies of distributed reports, copy of field notes, copies of calibration records, and other information relevant to the Industrial Hygiene Program onsite. All records must be maintained by TVA and associated employers for a minimum of 30 years.

Various reports and notification activities will occur as a result of industrial hygiene activities at the site. The following is a summary of the reports and their frequency.

2.3.1 Worker Notification

Employees will be notified of the results of all sampling regardless of levels recorded. For personal exposure monitoring, this will generally consist of specific notification letters. Employee notification letters for TVA staff will be provided by Jacobs for distribution by TVA Safety staff. Jacobs will distribute letters to subcontracted personnel.

2.3.2 Site-Wide Notification

In the event results dictate the need to notify SEGs or the entire site, Jacobs will develop the notification announcement and distribute via email, postings, and other announcements as necessary.

2.3.3 Weekly Reporting

Relevant industrial hygiene field notes will be rolled up into the existing weekly HSE report and will include general discussion of industrial hygiene activities and any notable observations.

2.3.4 Monthly Reports

Formal monthly reports of industrial hygiene activities performed onsite include interpreted results summary, table of monthly and year to date sample results, general conclusions about exposure levels, and any identified areas of concern.

This report will be generated by the Jacobs Site Industrial Hygiene Lead Technologist and will be reviewed by the Jacobs Site HSE Manager and Jacobs Industrial Hygiene Manager prior to distribution. Due to the lag time in receiving lab results, the report will be issued no later than the end of the following month for the previous month (e.g., end of July for June results).

2.4 VERIFY UPPER CONFIDENCE LIMITS AND MANAGE FURTHER MONITORING

When integrated monitoring is performed, a statistically significant sample of workers will be selected for exposure monitoring per the direction of the Jacobs Industrial Hygiene Manager, recommended National Institute of Occupational Safety and Health (NIOSH) sample methods, and other recognized industry standards. Nearby areas or employees may be monitored if it is suspected there is a dispersed impact of the contaminants of concern, however, these personnel will not count toward the statistical significance of the task workers monitored.

An evaluation of all exposure groups will be performed to determine exposure potential for recognized stressors. If data gaps exist, additional monitoring will be performed until all SEGs have been adequately characterized. Once an exposure group is adequately characterized, Exposure Levels (ELs) will be statistically evaluated. If data sets are large enough, parametric statistics will be utilized using the 95th percentile Upper Confidence Limit (UCL). For small data sets, Bayesian statistics will be utilized to determine with 95% confidence which exposure bands (Per Table 2-2) the associated levels fall into. Applicable ELs will be those listed in Section 4 and Table 4-2 of the SWSHP or the most recent version of applicable Federal, State, or Occupational Safety and Health Administration (OSHA) regulations or the most recent edition of the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values booklet.

Table 2-2
Summary of Exposure Monitoring Actions

If the UCL is	The Exposure is Deemed	Further Monitoring consists of
<10% of the EL	Insignificant	Verifying the process and exposure potential remain unchanged
>10% and <50% of the EL	Marginal	Quarterly integrated
>50% and <100% of the EL	Significant	Monthly integrated
>100%	Unacceptable	Routinely until controls have adequately lowered exposures

If an Action Level in Section 4 of the SWSHP is exceeded, notification will be made verbally in the daily planning meeting. A preliminary review and validation will be conducted by the Site Industrial Hygienist or the Jacobs CIH. The activities, equipment, and conditions of the day of sampling are evaluated to determine potential contributing factor(s) to the exposure, with the goal of preventing similar situations or identifying controls to reduce exposures to below criterion levels.

Depending on the results of the preliminary review and validation, additional sampling or review may be necessary, or action items recommended for review. Exceedances indicating the need for upgrading respiratory protection will be immediately brought to the attention of the TVA and Jacobs Program Managers.

3.0 IDENTIFICATION OF MONITORING NEEDS

The need to include personnel or areas in industrial hygiene monitoring programs will be based on a number of factors; however, they will be primarily based on assessing the potential exposures of routine field activities.

3.1 EXISTING PROCESS

Currently the recognized processes onsite include; dredging, river operations, ash removal from land-based release areas, ash removal from existing storage areas, ash processing in the Ball Field, ash load-out, site maintenance, equipment maintenance, field supervision, Skimmer Wall recovery, Skimmer Wall construction, offsite utility construction, and office activities. These processes may occur within a number of different scenarios or with different contractors; however, the relative occupational exposures and stressors are expected to be relatively consistent.

3.2 NEW PROCESS

In the event new activities are added, an evaluation will be conducted to determine if new SEGs are created from those activities. If new SEGs are added, they will be included for routine monitoring along with other SEGs. Monitoring priority will be based on potential for exposure.

3.3 WORKER COMPLAINTS

Worker complaints are to be taken seriously and will be given immediate attention for initial evaluation. Initial evaluation includes direct observation of the related tasks, reviews of existing data for similar sampling, utilization of direct read instruments, and, when appropriate, discussion with the individuals involved.

If it appears that worker complaints present valid or real potential exposures, those complaints will be addressed by conducting integrated monitoring as soon as practical.

3.4 MANAGEMENT REQUEST

Management requests will also be given priority for initial evaluation which will include direct observation of the related tasks, reviews of existing data for similar sampling, and when possible, utilization of direct read instruments.

If after initial evaluation no conclusions can be drawn about actual exposure levels, integrated monitoring will be conducted as soon as practical.

4.0 CHEMICAL HAZARD MONITORING METHODS

4.1 STRESSORS OF POTENTIAL CONCERN

Table 4-1 lists the potential chemical hazards currently identified for the site and the applicable NIOSH methods associated with the particular contaminate sampling and analytical methods.

Table 4-1
Recognized Sample Methods to be Utilized

Method Number	Stressors of Potential Concern	Sampling Media
NIOSH 0500	Particulates, Total	37mm MWMCE ²
NIOSH 0600	Particulates, Respirable	37mm PVC ³
NIOSH 7300	Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron Oxide, Lead, Magnesium, Manganese, Molybdenum, Nickel, Potassium, Selenium, Sodium, Thallium, Vanadium, Zinc Oxide	37mm MWMCE
NIOSH 7500	Silica, Amorphous; Silica, Quartz; Silica, Cristobalite; Silica, Tridymite	37mm PVC
Per CHP ¹	Radium-226, Radium-228, Thorium-228, Thorium-230, Thorium-232, Thorium-234, Uranium-234, Uranium-235, Uranium-238	37mm MWMCE
NA	Misc. indoor air quality concerns (Office Trailers)	Varies

Notes:

¹ Per CHP – as coordinated by Jacobs Certified Health Physicist

² MWMCE – matched weight mixed cellulose ester

³ PVC – polyvinyl chloride

4.2 EVALUATION METHODS TO BE USED

Potential inhalation hazards to those Stressors of Potential Concern (SOPC) listed in Table 4-1 will be evaluated through proper sampling techniques and review.

To initially determine potential exposures, the Site Industrial Hygienist will first review prior documented data collected by TVA and EnSafe. An evaluation will be performed to determine if adequate characterization has been achieved for each SEG or if data gaps exist.

If data gaps appear to exist, an objective evaluation will be done utilizing when possible the following sequence:

1. Calculations or exposure modeling
2. Direct reading evaluations
3. Integrated monitoring techniques

If methods 1 or 2 provide information that, with conservative assumptions, can verify or “prove” no exposures, the evaluation will be properly documented and will stop at that point. If this cannot be achieved, integrated monitoring will be performed and data collected until adequate conclusions can be drawn.

All integrated monitoring will be performed using recognized industry methods, primarily NIOSH Sample and Analytical Methods. As a general rule, area or environmental samples will not be used to evaluate worker exposures as significant variability may exist between the stationary monitor and the mobile worker and their breathing zone. Area monitoring may be used to evaluate the general effectiveness of controls samples and the potential impact of downwind / off site receptors.

Field quality control will follow the NIOSH methods which typically require one field blank for every 10 primary personal or area samples submitted for laboratory analysis. Field blank media will be selected randomly from the same lot as primary sample media. Field blanks will accompany primary samples at all times onsite and during shipment to and from the laboratory.

4.3 FREQUENCY OF EXPOSURE MONITORING

Personnel identified by SEGs will be repeatedly monitored as needed to ensure potential inhalation hazards are controlled below Action Levels. Not all SEGs will be sampled with the same frequency, dependant on determining site factors, but all SEGs should be periodically re-evaluated. The actual sampling strategy for a specific day is determined or approved by the Site Industrial Hygiene Lead Technologist, project CIH, or designee.

Frequency of exposure monitoring will be based upon the exposure risk rating identified for a given SEG. Once an SEG has been adequately characterized based on the UCL for the data set, additional verification monitoring will be based on Table 2-2.

4.4 EXPOSURE LIMITS

4.4.1 Sequential Analysis

Based on the results of prior sampling, a sequential analysis approach for total particulate and metals samples has been adopted. Samples are collected and initially analyzed for total particulate. If total particulate concentrations are at or above 0.5 milligrams per cubic meter, additional analysis is conducted for arsenic and cadmium provided they have adequate sample volume to record concentrations low enough to be meaningful.

4.4.2 Action Levels

Action Levels for the site are typically not regulatory levels; however, several SOPCs have specific OSHA-defined Action Levels. If an OSHA Action Level does not exist, TVA generally uses one-half of the time-adjusted Permissible Exposure Level (PEL) (Brief and Scala Method). Applicable action levels will be those listed in Section 4 and Table 4.2 of the SWSHP.

TVA is a Federal entity and is therefore governed by Federal OSHA PEL's. In addition, there are several contracting partners onsite that are required to follow the Tennessee (TN)-OSHA PEL's. The PEL's that will be mandated for compliance will be most conservative of either TN or Federal OSHA.

The Threshold Limit Values, (TLV's) found in ACGIH and/or the Recommended Exposure Limits (RELs) found in NIOSH will be typically used as a lower level indicator to provide an early warning of potential exposure risks. These indications will provide an opportunity for initiating further reviews, performing an evaluation and implementing subsequent controls that will aid in

maintaining exposures as low as reasonably achievable and maintain them to less than the established Action Levels required by law under both TN and Federal OSHA.

4.4.3 Exceedances

If an Action Level is exceeded, a preliminary review will be conducted by the Site Industrial Hygiene Lead Technologist; if this individual is not available, it will be conducted by the project CIH, TVA, or Site Safety staff. The activities, equipment, and conditions of the day of sampling are evaluated to determine potential contributing factors to the exposure with the goal of preventing similar situations or identifying controls to reduce exposures to below criterion levels.

Depending on the results of the preliminary review, additional sampling or review may be necessary, or action items recommended for review. Exceedances indicating the need for upgrading respiratory protection will be brought to the attention of the TVA Site Manager.

If a TLV or REL value is exceeded, the site IH team will investigate the result further to determine exceedance based on laboratory and sampling limitations or if actual exposure has occurred. If an actual TLV/REL exceedance has occurred, the occurrence shall be documented along with the means of how the exceedance was confirmed. This lower level indicator would then be discussed with the CIH for toxicology and risk determination.

5.0 PHYSICAL HAZARD MONITORING

5.1 NOISE

There is a potential for personnel to be exposed to noise levels above the OSHA allowable maximum 8-hour Time Weighted Average during normal field operations. The Site Industrial Hygienist will first review TVA and EnSafe documentation to determine the severity of each existing noise exposure data prior to conducting sound level measurements and personal noise dosimetry on individuals in each SEG. Based upon this review and assessment, priority measuring will be conducted for those SEGs having the greatest need. Not all SEGs will require the same level of support or measurement; however, all SEGs should have or will be evaluated.

All noise sampling instruments and field calibrators will be maintained within the most current calibration cycles.

5.2 THERMAL STRESS

Heat stress monitoring equipment will typically consist of area sampling devices capable of Wet Bulb Globe Temperature measurements. Environmental heat measurements should be made as close as possible to the specific work area where the worker is exposed. Please note that for some operations (e.g., heavy equipment operations), this may require sampling inside the cab of applicable equipment. Equipment with air-conditioned cabs will generally not be sampled. Heat stress measurement equipment must have been serviced per manufacturer's specifications.

5.3 INDUSTRIAL ERGONOMICS

Numerous activities onsite present ergonomic stress and strain and the potential for personnel to suffer acute and chronic soft tissue injuries. An initial evaluation will be done of the various SEGs to determine if they fall within low, medium, or high potential for ergonomic injury.

Formal industrial ergonomic evaluations will be done for all those SEGs deemed to be at high risk for ergonomic problems. Controls will be implemented as necessary to minimize the related stressors. Once controls are implemented, a follow-up evaluation will be performed to verify they adequately address the issues identified.

Those SEGs falling into medium or low-risk categories will be evaluated on an as needed basis, primarily based on worker complaints or management request.

5.4 OFFICE ERGONOMICS

Those personnel who predominantly work in an office environment (project controls, administrative personnel, IT support, communications personnel, data management, etc.) should perform an initial self assessment of their work station to verify proper ergonomic configuration. If issues are identified or require input of an industrial hygienist, work station evaluations will be performed. In either case, all self evaluations and ergonomic consultations will be recorded and maintained within the industrial hygiene project files.

5.5 FREQUENCY OF EXPOSURE MONITORING

Noise and ergonomic stressors will be evaluated until proper exposure characterization for each SEG can be established. Additional monitoring will be performed if the process is known to have changed in a manner that would increase the potential for exposure.

Thermal stress will be evaluated daily during periods of time where it is likely to create heat related conditions onsite and will remain consistent with the process outlined in Sections 5.3 and 5.4 of the SWSHP.

5.6 EXPOSURE LIMITS RECOGNIZED

Exposure limits and sources of limits vary significantly for associated physical hazards. The following breaks out recognized limits for likely physical hazards to be encountered onsite.

5.6.1 Noise

All exposure limits for noise will be based on 29 CFR 1910.95 – Occupational Noise Exposure. These limits are currently 90 dBA for an 8-hour exposure with an Action Level of 85 dBA for an 8 hour exposure. With extended work shifts frequently encountered onsite, PELs for noise will be adjusted using a 5 dB doubling rate and Table G-16 of 29 CFR 1910.95.

5.6.2 Heat Stress

Limits for heat stress are established in the SWSHP, Section 5.3, and follow TVA Safety Procedure 806 for heat stress control. It is generally recognized that the ACGIH limits established for heat stress are too conservative for acclimatized workers and on which will not be used to base work / rest cycles.

5.6.3 Ergonomics

Numerous standards exist for ergonomic control; however, none are considered regulatory. When ergonomic evaluations are conducted, results will be compared to recognized industry standards including NIOSH and the ACGIH.

6.0 QUALITY CONTROL / QUALITY ASSURANCE

6.1 EQUIPMENT CALIBRATION

Sampling and calibration of pumps and dosimeters will be conducted in accordance with equipment manufacturer recommendations, or as stipulated in the applicable OSHA or NIOSH Method. Personal sampling pumps will be calibrated before and after each day's sampling per SOP-HSE-037 Industrial Hygiene Personal Air Monitoring Procedure.

6.2 LABORATORY QUALITY CONTROL

All samples submitted for laboratory analysis will be analyzed by a lab accredited by the American Industrial Hygiene Association (AIHA) or participate in the National Voluntary Lab Accreditation Program. The use of non-accredited labs may be necessary for unusual analytes (e.g., NORM); in this case, approval of a CIH is required prior to submittal. Laboratories will be required to adhere to the contractual QC requirements and will be subjected to audits by the QA Team.

6.3 DATA VALIDATION

Data validation will be performed on data from personal integrated monitoring samples. The laboratory quality control samples to be reviewed will include blanks, duplicates, lab control standards, and calibration verification standards. Sample completeness and field blank/field duplicate results will also be evaluated if available.

The purpose of the validation is to ensure that the reported data is usable for its intended purposes. Samples that are not within the acceptable criteria for parameters representing sample collection, handling and analysis criteria will be identified, from which assessments can be made of data usefulness. These criteria will be developed in conjunction with the selected laboratory using guidance from the laboratory accreditation body.

The laboratory will deliver sample data packages in parallel to both the project Industrial Hygiene Program and the project Data Management Team/QA Team. For the Industrial Hygiene Program the following information is required:

- Summary data package in PDF form
- An Electronic Data Deliverable (EDD) to be used for data import into the JEG industrial hygiene database

Upon receipt of the analytical laboratory data, the Industrial Hygiene Lead Technologist compiles individual reports and assesses measured values against OSHA and other applicable exposure limits. Calculations of the dataset may be performed through an industrial hygiene database, spreadsheet, or other methods to facilitate documentation of the review. The Industrial Hygiene Lead Technologist also reviews measured values for reasonability against known field conditions associated with the sample, measurements taken elsewhere the same day, or historical measurements for a particular work activity.

The QA Team and TVA will receive an EDD and a Level IV data package. Upon receipt of the analytical laboratory data, the QA Team validates the data and the Data Management Team stores the data in EQUIS[®] in accordance with the *Quality Assurance Project Plan for the Tennessee Valley Authority Kingston Ash Recovery Project* (TVA-KIF-QAPP) and the *Data*

Management Plan for the Tennessee Valley Authority Kingston Ash Recovery Project (TVA-KIF-DMP-001, 2009)

If questions arise during data validation by either party, immediate communication must be made via email between the IH Team and the QA and Data Management Teams in order to ensure appropriate and parallel re-assessment of data is performed from a QA perspective. If data are required to be resubmitted by the laboratory, revised data will be sent in parallel to both the Industrial Hygiene Program and the project Data Management Team/QA Team. All discrepancies will be reconciled prior to either dataset being considered final. Once both datasets are consistent, the data are considered final.

6.4 DATA QUALITY OBJECTIVES

The Data Quality Objective (DQO) process is a logical series of seven steps that guides investigators to a plan for industrial hygiene data. The process is both flexible and repetitive, and applies to both decision-making (e.g., compliance/non-compliance with a standard) and estimation. The DQO process establishes performance and acceptance criteria that drive the plan for collecting data of sufficient quality and quantity to support the goals of the industrial hygiene study(ies). The DQO process leads to efficient and effective expenditures of resources; consensus on the type, quality, and quantity of data needed to meet project goals; and full documentation of actions taken during project maturity.

The steps in the DQO process are as follows:

1. State the problem
2. Identify the goal(s) of the study
3. Identify information inputs
4. Define the study boundaries
5. Develop the analytic approach
6. Specify performance or acceptance criteria
7. Develop the plan for data acceptance

6.4.1 Problem Statement

On December 22, 2008, a coal ash release occurred at the KIF, allowing a large amount of coal ash to escape into the adjacent waters of the Emory River and surrounding land, releasing about 5.4 million cubic yards and covering about 300 acres.

The coal ash, a by-product of a coal-fired power plant, originates from coal burned in boilers for power production at the KIF. The coal, in its natural state, contains various metals that can be retained with the ash after burning. The ash itself is primarily composed of fine silica particles very similar to sand, but trace amounts of arsenic, selenium, cadmium, boron, thallium, beryllium, and other metals which occur naturally in the coal remain in the ash after coal combustion. These metals are typically bound to the ash.

In an effort to move the coal ash to its original location or offsite by rail requires much heavy equipment capable of moving the ash. This equipment includes such items as excavators, dump trucks, dredges, scraper pans, etc. Therefore the activities require drivers, operators, and support laborers, or personnel that have the potential for exposures. Due to the potential inhalation hazards and the CERCLA designation, Hazardous Waste Operations and Emergency Response controls have been placed on the site.

6.4.2 Project Goals

The primary objectives for industrial hygiene monitoring are to:

- Provide continuing confirmation that KIF-related constituents have not negatively affected the Kingston Ash Recovery Project site personnel's health by either acute (or single) or chronic (or repeated) exposures.
- Provide respiratory exposure data sufficient to substantiate efforts to minimize risk of adverse exposures are in place and effective for all individuals spanning all SEGs.
- Evaluate the effectiveness of best management practices (e.g., dust control, respiratory protection, etc.) in preventing or mitigating respiratory occupational exposures.

6.4.3 Information Inputs

The information necessary to achieve the objectives includes the following:

- Reoccurring and scheduled industrial hygiene personal air monitoring.
- Analytical results of air monitoring for ash-related constituents.

6.4.4 Study Boundaries

Personal (industrial hygienic) air monitoring will be conducted on all SEGs:

- Identified as having a potential respiratory exposure to coal ash constituents.
- Supervisory requests of personnel having been evaluated by industrial hygiene staff and verified as having potential exposures.

6.4.5 Analytic Approach

Coal ash contains numerous constituents that have been linked to adverse health effects in human receptors. Specific constituents of interest include silica, arsenic, selenium, beryllium among others. Analysis should be conducted by laboratories operating in accordance with the standards set forth by AIHA. Analysis should also be conducted based upon the associated methods identified by NIOSH.

6.4.6 Performance or Acceptance Criteria

The null hypothesis for personal industrial hygiene air monitoring is: The percentage of coal ash constituents do not result in occupational respiratory health hazards to personnel working onsite. The alternative hypothesis is: The percentage of coal ash constituents result in occupational respiratory health hazards to personnel working onsite.

The null hypothesis for dust control is: Best Management Practices (BMPs) are completely adequate for controlling occupational exposures of ash-related contaminants during removal operations. The alternative hypothesis is: BMPs are not completely adequate for controlling occupational exposures of ash-related contaminants during removal operations.

6.4.7 Data Acceptance

Data acceptance is based on criteria established in Section 6.3.

6.5 QUALITY ASSURANCE / QUALITY CONTROL AND QUALITY ASSURANCE PROJECT PLAN (QAPP) CROSS WALK TABLES

Jacobs uses the NIOSH Analytical and Sampling Methods outlined in the *NIOSH Manual of Analytical Methods* (NMAM) to perform the air sampling conducted on the Kingston Ash Recovery Project site. NMAM is a collection of methods for sampling and analysis of contaminants in workplace air of workers who are occupationally exposed. These methods have been developed or adapted by NIOSH or its partners and have been evaluated according to established experimental protocols and performance criteria. NMAM also includes chapters on quality assurance, sampling, portable instrumentation, etc. The methods used as described below in Table 6-1 can be found on the Internet at: <http://www.cdc.gov/niosh/docs/2003-154/>

Table 6-1
OSHA / NIOSH Analytical and Sampling Methods and Site SOPs

Method/SOP Number	Method/Document Title
NIOSH 0500	Particulates not otherwise regulated, total 0500
NIOSH 0600	Particulates not otherwise regulated, respirable 0600
NIOSH 7300	Elements by ICP (nitric/perchloric acid ashing) 7300
NIOSH 7500	Silica, crystalline, by XRD (filter re-deposition) 7500
SOP-HSE-037	Industrial Hygiene Personal Air Monitoring Procedure

Table 6-2
Quality Assurance Project Plan Cross-Walk

QAPP Element	Location in SWSHP	Location in NIOSH Methods
Data Quality Objectives	Appendix K, 6.4 Data Quality Objectives	
Industrial Hygiene Program Design	Appendix K, Section 2.0, Industrial Hygiene Process	
Sampling Methods	Appendix K, Section 4.0, Chemical Hazard Monitoring Method; Section 2.1, Identification of Similar Exposure Groups; Table 2-1, Similar Exposure Groups Identified at the Kingston Ash Recovery Project Site	Applicable NIOSH Methods (e.g., 0500, 0600, 7300, 7500, etc.)
Sample Collection	SOP-HSE-037, Industrial Hygiene Personal Air Monitoring Procedure	
Data Review and Validation (QAPP Section 21.0 22.0)	Appendix F, Appendix K, Section 6.3, Data Validation	
Assessments and Response Actions (QAPP)	Appendix K, Section 2.4 Verify Upper Confidence Limits and Manage Further Monitoring; and Section 2.3 Document Control, Reporting, and Notification.	

ATTACHMENT K-1

Sample Health Hazard Evaluation by Exposure Group form

